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(54) BROADCAST SYSTEM AND RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To enhance user-friendliness by which a user can view digital contents, in matching with the user's preference.

SOLUTION: A broadcasting system 1 adds an attribute vector A (shown in Equation 1) of digital contents to the broadcast digital contents. A selection vector S, denoting the preference of the user, is set to a filter section 12. The filter section 12 applies a

standardized inner product arithmetic operation between the selection vector S and the attribute vector A for selecting the broadcast program and to record the selected program. Equation 1.

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#### **CLAIMS**

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[Claim(s)]

[Claim 1] The broadcasting station which broadcasts a digital content with the attribute information a digital content and its attribute were indicated to be, A receiving means to receive the above-mentioned digital content and attribute information which were broadcast from the broadcasting station, The record medium which records the digital content and attribute information which were received, and an output means to output the digital content which received, It has two or more receiving sets which have a selection means to compare the selection information which shows a user's taste with the attribute information added to the digital content,

and to choose a digital content. The above-mentioned attribute information is expressed by the n-dimensional vector A by which the strength of the attribute of each item when dividing the attribute of a digital content for every item is used as the element. The above-mentioned selection information The strength of the taste of each item when dividing a user's taste for every item is expressed by the n-dimensional vector S used as the element. The class and sequence of an item of the above-mentioned attribute information and the above-mentioned selection information Are in agreement by the vector A of attribute information, and the vector S of selection information. The selection means of the above-mentioned receiving set The broadcast system characterized by judging whether the inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content is performed, and the digital content is chosen based on the inner product result of an operation.

[Claim 2] The selection means of the above-mentioned receiving set is a broadcast system according to claim 1 characterized by calculating the sorting value P based on the following formulas, and choosing a digital content based on the magnitude of this sorting value P.

[Equation 1]

$$A = (a_1, a_2, a_3, \dots, a_n)$$

$$S = (s_1, s_2, s_3, \dots, s_n)$$

$$P = \frac{A \cdot S}{|A| |S|}$$

$$\text{ここで } A \cdot S = \sum_{k=1}^n a_k S_k$$

$$|A| = \sqrt{\sum_{k=1}^n a_k^2}$$

$$|S| = \sqrt{\sum_{k=1}^n S_k^2}$$

なお、A,S は0ベクトルではない。

[Claim 3] The vector S of the above-mentioned selection information is a broadcast

system according to claim 1 characterized by asking from the vector A of the attribute information added to two or more digital contents chosen by the user.

[Claim 4] The vector S of the above-mentioned selection information is a broadcast system according to claim 3 characterized by asking based on the following formulas.

[Equation 2]

$$S = \frac{1}{M} \sum_{k=1}^M A_k$$

ここで、M はユーザが選択したデジタルコンテンツの数とする。

また、ユーザが K 番目に選択したデジタルコンテンツの

属性ベクトルを

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

とする。

[Claim 5] The vector S of the above-mentioned selection information is a broadcast system according to claim 3 characterized by asking based on the following formulas.

[Equation 3]

$$S = \frac{1}{M} \sum_{k=L-M+1}^L A_k$$

ここで、ベクトル S を求めるためのウィンドウ数を M とし、

ベクトル S を求めるための複数のデジタルコンテンツの選択の

起点を L とする。

また、ユーザが K 番目に選択したデジタルコンテンツの

属性ベクトルを

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

とする。

[Claim 6] The vector S of the above-mentioned selection information is a broadcast system according to claim 3 characterized by asking from the average of the vector A of the attribute information added to two or more digital contents to which playback beyond fixed time amount was performed by the user.

[Claim 7] The vector S of the above-mentioned selection information is a broadcast system according to claim 3 characterized by asking from the average of the vector A of the attribute information added to two or more digital contents to which image transcription reservation was performed by the user.

[Claim 8] The vector S of the above-mentioned selection information is a broadcast system according to claim 3 characterized by asking for the average of the vector A of the attribute information added to two or more digital contents to which playback beyond fixed time amount was performed by the user, and the average of the vector A of the attribute information added to two or more digital contents to which image transcription reservation was performed by the user from the thing which joined together by carrying out weighting, respectively.

[Claim 9] The selection means of the above-mentioned receiving set is a broadcast system according to claim 1 characterized by choosing a digital content based on the vector S of the selection information corresponding to two or more users.

[Claim 10] A receiving means to receive the above-mentioned digital content and attribute information which were broadcast from the broadcasting station, The record medium which records the digital content and attribute information which were received, and an output means to output the digital content which received, It has a selection means to compare the selection information which shows a user's taste with the attribute information added to the digital content, and to choose a digital content. The above-mentioned attribute information The strength of the attribute of each item when dividing the attribute of a digital content for every item is expressed by the n-dimensional vector A used as the element. The above-mentioned selection information The strength of the taste of each item when dividing a user's taste for every item is expressed by the n-dimensional vector S used as the element. The class and sequence of an item of the above-mentioned attribute information and the above-mentioned selection information Are in agreement by the vector A of attribute information, and the vector S of selection information. The above-mentioned selection means The receiving set characterized by judging whether the inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content is performed, and the digital content is chosen based on the inner product result of an operation.

[Claim 11] The above-mentioned selection means is a receiving set according to claim 10 characterized by calculating the sorting value P based on the following formulas, and choosing a digital content based on the magnitude of this sorting value P.

[Equation 4]

$$A = (a_1, a_2, a_3, \dots, a_n)$$

$$S = (s_1, s_2, s_3, \dots, s_n)$$

$$P = \frac{A \cdot S}{|A| |S|}$$

$$\text{ここで } A \cdot S = \sum_{k=1}^n a_k S_k$$

$$|A| = \sqrt{\sum_{k=1}^n a_k^2}$$

$$|S| = \sqrt{\sum_{k=1}^n S_k^2}$$

なお、 $A, S$  は 0 ベクトルではない。

[Claim 12] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 10 characterized by asking from the vector  $A$  of the attribute information added to two or more digital contents chosen by the user.

[Claim 13] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 12 characterized by asking based on the following formulas.

[Equation 5]

$$S = \frac{1}{M} \sum_{k=1}^M A_k$$

ここで、 $M$  はユーザが選択したデジタルコンテンツの数とする。

また、ユーザが  $K$  番目に選択したデジタルコンテンツの

属性ベクトルを

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

とする。

[Claim 14] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 12 characterized by asking based on the following formulas.

[Equation 6]

$$S = \frac{1}{M} \sum_{k=L-M+1}^L A_k$$

ここで、ベクトル  $S$  を求めるためのウィンドウ数を  $M$  とし、  
ベクトル  $S$  を求めるための複数のデジタルコンテンツの選択の  
起点を  $L$  とする。

また、ユーザが  $K$  番目に選択したデジタルコンテンツの  
属性ベクトルを

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

とする。

[Claim 15] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 12 characterized by asking from the average of the vector  $A$  of the attribute information added to two or more digital contents to which playback beyond fixed time amount was performed by the user.

[Claim 16] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 12 characterized by asking from the average of the vector  $A$  of the attribute information added to two or more digital contents to which image transcription reservation was performed by the user.

[Claim 17] The vector  $S$  of the above-mentioned selection information is a receiving set according to claim 12 characterized by asking for the average of the vector  $A$  of the attribute information added to two or more digital contents to which playback beyond fixed time amount was performed by the user, and the average of the vector  $A$  of the attribute information added to two or more digital contents to which image transcription reservation was performed by the user from the thing which joined together by carrying out weighting, respectively.

[Claim 18] The above-mentioned selection means is a receiving set according to claim 10 characterized by choosing a digital content based on the vector  $S$  of the selection information corresponding to two or more users.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the broadcast system which broadcasts digital contents, such as a film and music, and its receiving set.

[0002]

[Description of the Prior Art] In recent years, development of the digital television broadcast which broadcasts various programs, such as an image, music and a game, and computer data, to many users through a cable, satellite broadcasting service, a ground wave, etc. is progressing.

[0003] By using such digital television broadcast, a user can cancel the complicatedness for purchasing the program of a film, music and a game, computer data, etc. with record media, such as an optical disk and a magnetic tape, and it becoming unnecessary to rent it, and acquiring a program.

[0004]

[Problem(s) to be Solved by the Invention] However, in such a digital-broadcasting system, since a broadcasting station side, on the other hand, chooses the time zone and the content of the program to broadcast as a target and broadcasts them, a user cannot choose freely the time zone or the content of the program which wish to view and listen.

[0005] Therefore, a user needs to view and listen to the program of the time zone and the content suitable for hope using a time shift function, a library function, etc. which are realized by the video tape recorder. However, even if it used the time shift function and document library facility of a video tape recorder, record reservation had to be operated and it had to choose programming [ which he wishes from all the programs broadcast further ], and actuation was dramatically complicated and inconvenient.

[0006] This invention is made in view of such the actual condition, and aims at offering the broadcast system and receiving set which raised the convenience which views and listens to the digital content which suited a user's taste.

[0007]

[Means for Solving the Problem] In order to solve an above-mentioned technical problem, the broadcast system concerning this invention The broadcasting station which broadcasts a digital content with the attribute information a digital content and its attribute were indicated to be, A receiving means to receive the above-mentioned digital content and attribute information which were broadcast from the broadcasting station, The record medium which records the digital content and attribute information which were received, and an output means to output the digital content which received, It has two or more receiving sets which have a selection means to compare the selection information which shows a user's taste with the attribute information added to the digital content, and to choose a digital content. The above-mentioned attribute information is expressed by the  $n$ -dimensional vector  $A$  by which the strength of the attribute of each item when dividing the attribute of a digital content for every item is used as the element. The above-mentioned selection information The strength of the taste of each item when dividing a user's taste for every item is expressed by the  $n$ -dimensional vector  $S$  used as the element. The class



and sequence of an item of the above-mentioned attribute information and the above-mentioned selection information Are in agreement by the vector A of attribute information, and the vector S of selection information. The selection means of the above-mentioned receiving set The inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content is performed, and it is characterized by judging whether the digital content is chosen based on the inner product result of an operation.

[0008] In such a broadcast system, the attribute information on that digital content is added to the digital content broadcast, and the digital content corresponding to a user's taste is chosen from the broadcast digital contents based on the selection information which showed the taste of this attribute information and a user. And after recording the selected digital content on a record medium, it views and listens, and in this broadcast system, it views and listens to the digital content which suited taste out of the recorded digital content.

[0009] Here, the above-mentioned attribute information is expressed by the n-dimensional vector A by which the strength of the attribute of each item when dividing the attribute of a digital content for every item is used as the element, and the above-mentioned selection information is expressed by the n-dimensional vector S by which the strength of the taste of each item when dividing a user's taste for every item is used as the element. And it is defined as the class and sequence of an item of the above-mentioned attribute information and the above-mentioned selection information being in agreement by the vector A of attribute information, and the vector S of selection information. Based on the attribute information and selection information which were expressed with such a vector, the selection means of the above-mentioned receiving set performs the inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content, and judges whether the digital content is chosen based on the inner product result of an operation.

[0010] Moreover, a receiving means to receive the above-mentioned digital content and attribute information that the receiving set concerning this invention was broadcast from the broadcasting station, The record medium which records the digital content and attribute information which were received, and an output means to output the digital content which received, It has a selection means to compare the selection information which shows a user's taste with the attribute information added to the digital content, and to choose a digital content. The above-mentioned attribute information The strength of the attribute of each item when dividing the attribute of a digital content for every item is expressed by the n-dimensional vector A used as the element. The above-mentioned selection information The strength of the taste of each item when dividing a user's taste for every item is expressed by the n-dimensional vector S used as the element. The class and sequence of an item of

the above-mentioned attribute information and the above-mentioned selection information Are in agreement by the vector A of attribute information, and the vector S of selection information. The above-mentioned selection means The inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content is performed, and it is characterized by judging whether the digital content is chosen based on the inner product result of an operation.

[0011] In such a receiving set, the digital content to which attribute information was added is received, and the digital content corresponding to a user's taste is chosen from the broadcast digital contents based on the selection information which showed the taste of this attribute information and a user. And after recording the selected digital content on a record medium, it views and listens, and in this receiving set, it views and listens to the digital content which suited taste out of the recorded digital content.

[0012] Here, the above-mentioned attribute information is expressed by the n-dimensional vector A by which the strength of the attribute of each item when dividing the attribute of a digital content for every item is used as the element, and the above-mentioned selection information is expressed by the n-dimensional vector S by which the strength of the taste of each item when dividing a user's taste for every item is used as the element. And it is defined as the class and sequence of an item of the above-mentioned attribute information and the above-mentioned selection information being in agreement by the vector A of attribute information, and the vector S of selection information. Based on the attribute information and selection information which were expressed with such a vector, a selection means performs the inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content, and judges whether the digital content is chosen based on the inner product result of an operation.

[0013]

[Embodiment of the Invention] Hereafter, the digital-broadcasting system which applied this invention is explained as a gestalt of operation of this invention, referring to a drawing.

[0014] Hereafter, the digital-broadcasting system of the gestalt of operation of this invention is explained using drawing 1 .

[0015] The digital-broadcasting system 1 of the gestalt of operation of this invention serves as a system configuration equipped with a broadcasting station 2, a receiving set 3, and the monitor 4 and external storage 5 that are connected to a receiving set 3, as shown in drawing 1 .

[0016] The receiving set 3 has an antenna 10, a tuner 11, the filter section 12, the decryption section 13, the record playback section 14, the record playback media 15,

a decoder 16, a controller 17, the user interface section 18, and a modem 19.

[0017] A broadcasting station 2 broadcasts digital data using satellite broadcasting service, a cable network, terrestrial broadcasting, etc. The electronic program guide (EPG) in which the title information and the broadcast channel of the program which is various-kinds-programmed, such as a film, music, a television program, game data, computer data, and commercials, and is broadcast are shown by list is included in the digital data broadcast. Moreover, the attribute information which shows the attribute of the program is added to each program.

[0018] A broadcasting station 2 compresses and broadcasts the digital data to broadcast for example, by MPEG-2 method. Moreover, a broadcasting station 2 broadcasts by enciphering the digital data and attribute information to broadcast by the predetermined cryptographic key.

[0019] The program attribute which consists of a value, information, etc. on the various kinds which are needed for information selection and taste decision of the amount of accounting etc. whenever popular, the genres (news, sport, etc.) of the program, a performer, a keyword, directivity, a production person, and is described by attribute information, for example. A value and information original with each program are described by the broadcasting station 2 for each attribute of every by such attribute information.

[0020] A receiving set 3 receives the digital data broadcast from the broadcasting station 2 with an antenna 10, and carries out the received signal for a recovery, error correction processing, etc. with a tuner 11. The digital data carried out in the recovery etc. is sent to the filter section 12.

[0021] The digital data which consists of a program and attribute information is supplied to the filter section 12 from a tuner 11 or the record playback section 14. The selection information which shows a user's taste is set up, and the filter section 12 compares this selection information with the attribute information included in each program, filters the supplied program, and outputs only the program which suited a user's taste. ON/OFF setting out of whether this filter section 12 performs this filtering processing or it does not carry out is carried out by the control from a controller 17. In not performing filtering processing, it outputs all the inputted programs.

[0022] Digital data is supplied from the filter section 12, and the decryption section 13 decrypts digital data using a predetermined cryptographic key. Only the user registered by the broadcasting station 2 side can have this cryptographic key. The digital data with which decryption was carried out by the decryption section 13 is sent to the record playback section 14 or a decoder 16.

[0023] The record playback section 14 performs record playback of digital data to the record playback media 15. Usually, digital data [ being enciphered ] is supplied and records these on the record playback media 15 in the condition of having been

enciphered. In addition, accounting etc. may already be completed and, in the case of a free program etc., the record playback section 14 may record the digital data in the condition that the code was canceled at the record playback media 15.

[0024] Moreover, by control from a controller 17, the record playback section 14 reads the digital data currently recorded on the record playback media 15, and sends it out to the filter section 12.

[0025] As for a decoder 16, the digital data with which the code was decoded by the decryption section 13 is supplied. A decoder 16 decodes the program compressed by MPEG-2 method, and uses it as the video data of baseband, audio data, computer data, etc. And a decoder 16 outputs the decoded program to a monitor 4 or external storage 5 according to control by the user.

[0026] A controller 17 performs control for a tuner 11, the filter section 12, the decryption section 13, the record playback section 14, a decoder 16, the user interface section 18, and each part of modem 19 grade in generalization.

[0027] The user interface sections 18 are input units, such as a keyboard and a mouse, and a control section of those, for example, are for performing various kinds of setting out etc. through a monitor 4 top in choosing GUI displayed on the monitor 4 \*\*\*\*.

[0028] Through a public line, a modem 19 connects this receiving set 3, and a broadcasting station 2 and the predetermined Administration Bureau, and uploads the data transmitted to this broadcasting station 2 and predetermined Administration Bureau from a receiving set 3.

[0029] In the above receiving sets 3, the program broadcast from the broadcasting station 2 is received by the receiving set 3. A receiving set 3 receives the program broadcast by the antenna 10, and a recovery and error correction processing are made by the tuner 11. When viewing and listening to the broadcast program on real time, after selection processing of a program is carried out by the filter section 12, a code is decoded for the program in the decryption section 13. It is sent to a decoder 16, and a decoder 16 develops, for example, the program by which the code was decoded is displayed on a monitor 4. Moreover, when carrying out a time shift and viewing and listening to the broadcast digital content, the received program is sent to the record playback section 14 from the filter section 12, and is recorded on the record playback media 15. And after a program is reproduced by the time amount of a request of a user from the record playback media 15 and selection processing of a program is carried out by the filter section 12, a code is decoded for the program in the decryption section 13. It is sent to a decoder 16, and a decoder 16 develops, for example, the program by which the code was decoded is displayed on a monitor 4.

[0030] In such a receiving set 3, only the program which the received program was sorted out by the filter section 12, and only the program corresponding to a user's taste was recorded on the record playback media 15, or agreed to a user's taste at the time of real time and a time shift is outputted through a decoder 16.

[0031] Specifically with the receiving set 3, selection information is set as the filter section 12. The filter section 12 compares the attribute information added to the program with the selection information set as the interior, selects only the attribute information corresponding to selection information, and chooses the program to which the selected attribute information is added. When it is set up by the controller 17 whether selection actuation is performed and it is set as ON, it performs filtering actuation of a program, and this filter section 12 does not perform filtering actuation of a program, when set up off.

[0032] For example, in a receiving set 3, if the filter section 12 is set to ON when viewing and listening to the received program in other time zones (i.e., when carrying out a time shift and viewing and listening to a program), only the program chosen by this filter section 12 is stored in the record playback media 15. Therefore, in this receiving set 3, since there is no need of memorizing all the broadcast programs, the capacity of the record playback media 15 is used effectively. Moreover, in this receiving set 3, even if it does not operate record reservation, only the thing corresponding to a user's taste is memorized, and the complicated nature of actuation in which it must choose programming [ which he wishes from all the programs broadcast from this ] is avoided.

[0033] Moreover, with a receiving set 3, when carrying out a time shift and viewing and listening to the received program, all the received programs are memorized to the record playback media 15 by setting the filter section 12 to OFF, for example. And only the program chosen by this filter section 12 is outputted through a decoder 16 by setting the filter section 12 to ON at the time of playback.

[0034] Moreover, EPG is contained in the digital content broadcast. For this reason, in a receiving set 3, program selection in the case of performing viewing and listening on real time can be easily performed by displaying this EPG. The title information which the content of that program can understand to a user is displayed on this EPG as alternative. This EPG consists of text data, font data, an image data, graphical data, etc., and a video data etc. is contained if needed.

[0035] In a receiving set 3, in case a controller 17 displays EPG, it is made to display on the title of the program on this EPG here by adding change according to a user's taste. For example, when there is a program with which the selection information set as the filter section 12 and attribute information have agreed, the title information which shows the program is displayed in the condition of differing from other programs. A user chooses the title information displayed on EPG using the user interface section 18. Therefore, in this receiving set 3, when viewing and listening to a program at the time of real-time broadcast, selection actuation of the information by the user becomes easy.

[0036] Moreover, this EPG can be used, also when reproducing after storing a program in the record playback media 15. That is, this EPG is stored in the record playback

media 15 with a program, and also when a time shift is carried out, the program which uses this EPG and is reproduced can be chosen. Therefore, when the program with which the selection information set as the filter section 12 and attribute information have agreed be stored in the record playback media 15, selection actuation of the information by the user at the time of a time shift become easy by displaying the title information which show the program in the condition of differing from other programs. [0037] Moreover, the selection information set as the filter section 12 is set up, when it is set as the desired content of setting out from the alternative beforehand prepared on GUI at the beginning-of-using event of equipment or a user sets the value of a parameter as arbitration. Moreover, the selection information set as this filter section 12 may be changed at any time.

[0038] Moreover, the selection information set as this filter section 12 may switch selection information at the time of record and playback. For example, in preparing selection information by a domestic family's manpower and recording the received program on the record playback media 15, the selection information which took the OR of two or more selection information is set up, and it records only the program to which the attribute information which was in agreement with the selection information which took the OR was added. And in reproducing the recorded program, based on one selection information set up for one certain user, and the attribute information on the program currently recorded on the record playback media 15, it reproduces the program corresponding to the user's taste.

[0039] Moreover, after the beginning of using of this equipment, a controller 17 totals the attribute information on the program to which the user viewed and listened actually, and analyzes each user's taste. And a controller 17 changes weighting of the value of each parameter of the selection information set as the filter section 12 based on the analysis result, and optimizes it to a user's taste.

[0040] In addition, although he is trying to use above the program which compared selection information with attribute information and agreed to a user's taste with a receiving set 3, this may set the selection information into which the parameter which does not have a user's viewing-and-listening intention reversely was registered as the filter section 12, and may perform processing which eliminates positively the program to which a user does not want to view and listen.

[0041] Moreover, accounting accompanying viewing and listening of a program is performed when the code of a program is decoded by the decryption section 13 at the time of viewing and listening. Decode of the code of a program transmits account data to a broadcasting station 2 or the predetermined Administration Bureau through a modem 19. A broadcasting station 2 and the predetermined Administration Bureau charge to each user based on the transmitted account data. Moreover, also when the necessary procedure is taken for download of software, or the purchase of goods on a screen, the account data is transmitted to a broadcasting station or the

predetermined Administration Bureau.

[0042] Moreover, a receiving set 3 may transmit the selection information set as the filter section 12, or the analysis result which analyzed the viewing-and-listening track record to a broadcasting station 2 or the predetermined Administration Bureau through a modem 19. In this case, a broadcasting station 2 and the predetermined Administration Bureau can grasp each user's taste and viewing-and-listening track record. Thus, by grasping a user's taste and viewing-and-listening track record, it becomes possible to broadcast the program which agreed to a user's taste more. That is, although a program is broadcast towards a user with various taste, the program configuration also corresponding to the taste to a small number of user, such as responding to the request of the specific program for which could realize the program configuration [ it is useless like each of that user's greatest common measure, and ] which is not, and the a small number of user was anxious, is realizable.

[0043] Moreover, although advertising information is also included in the concrete content of the program, a receiving set 3 sorts out the received advertising information using the attribute information added to this advertising information. A receiving set 3 may prepare the record section only for advertisements in the record playback media 15. And the receiving set 3 chooses and records the advertising information corresponding to a user's taste, and you may make it make it view and listen to the advertising information currently recorded within the predetermined advertising time amount limit within a program in the record section only for these advertisements at the time of real-time reception. Thus, information required for a user is not only acquired, but it can raise advertising added value for a broadcaster by making the content of advertising information agree to a user's taste.

[0044] Since a program is automatically chosen based on the selection information which showed a user's taste as mentioned above according to the digital-broadcasting system 1 of the gestalt of operation of this invention, the complicatedness which selects programming [ which he wishes out of much programs ] is lost, and convenience increases. Moreover, in case a time shift is carried out, only a required program can be recorded and a record medium can be used effectively. Moreover, since according to this digital-broadcasting system 1 attribute information is displayed while displaying the title information on the program broadcast on real time, dialogism increases and the convenience at the time of performing real-time viewing and listening and record by the user improves.

[0045] Below the attribute information added to the program and the selection information set as the filter section 12 are further explained to a detail, and the concrete approach of filtering by the filter section 12 is also explained.

[0046] First, let the above-mentioned attribute information and selection information be vector information in the digital-broadcasting system 1. Hereafter, let attribute information be the  $n$ -dimensional ( $n \geq 2$ ) attribute vector  $A$ . Moreover, selection

information is taken as the n-dimensional ( $n \geq 2$ ) selection vector S.

[0047] Concretely, the n-dimensional attribute vector A is expressed, as shown in the following formulas (1).

[0048]

[Equation 7]

$$A = (a_1, a_2, a_3, \dots, a_n) \quad \dots (1)$$

[0049] Here,  $a_1, a_2, a_3, \dots, a_n$  are the elements of the attribute vector A, and express the strength of each attribute item which shows the attribute of a program. The sequence of the attribute item within the attribute vector A and the number (n) of an attribute item are defined beforehand.

[0050] The sequence and the number of an item of the attribute vector A are defined as follows, and, as for a certain program (for example, film program), a concrete value is described by each element ( $a_1$ – $a_n$ ). Thus, the described attribute vector A is added to the program, and is broadcast. In addition, even if the sequence of this attribute item is common to the digital-broadcasting system 1 and it broadcasts another program, that sequence does not change but only that value changes.

[0051]

[Equation 8]

$$A = (5, 2, 1, -3, -4, \dots, 0, 0, 8)$$

映画  
ドラマ  
スポーツ  
芸術性  
音楽性  
ドラマ性  
ホラー度  
娯楽度

属性項目

[0052] Moreover, concretely, the n-dimensional selection vector S is expressed, as shown in the following formulas (2).

[0053]

[Equation 9]

$$S = (s_1, s_2, s_3, \dots, s_n) \quad \dots (2)$$

[0054] Here,  $s_1, s_2, s_3, \dots, s_n$  are the elements of the selection vector S, and express the strength of each attribute item which shows a user's taste. The sequence of the attribute item within the selection vector S and the number (n) of an attribute item are the same as that of each element of the above-mentioned attribute vector. This



selection vector S is set as the filter section 12 in a receiving set 3.

[0055] The selection vector S to show this user's taste is generated by taking the average of two or more programs which the user reproduced. For example, a user presupposes that 50 programs to which he viewed and listened were chosen. The selection vector S is generable by taking the average of the attribute vectors A1–A50 for each program chosen as follows at this time.

[0056]

[Equation 10]

$$A_1 = (5, 2, 1, -3, -4, \dots, 0, 0, 8)$$

$$A_2 = (3, 3, 5, 1, 0, \dots, 0, 0, 8)$$

$$A_3 = (1, 2, 3, -1, 3, \dots, 0, 8, 0)$$

⋮

$$A_{50} = (2, 3, 4, -1, 3, \dots, 8, 0, 0)$$

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$$S = \frac{1}{50} \sum_{k=1}^{50} A_k = (2.1, 3.2, -1.1, 0.5, -4, \dots, 0.1, 0.3, 0.2)$$

[0057] That is, if the number of programs to choose is set to M, the selection vector S will be searched for like the following formulas (3).

[0058]

[Equation 11]

$$S = \frac{1}{M} \sum_{k=1}^M A_k \quad \dots (3)$$

[0059] Here, the attribute vector A of the program which the user chose as the k-th shall be as follows.

[0060]

[Equation 12]

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

[0061] Moreover, out of two or more reproduced programs, the number of programs used in order to search for the selection vector S may be limited, and you may ask as follows.

[0062]

[Equation 13]

$$S = \frac{1}{M} \sum_{k=L-M+1}^M A_k$$

[0063] M is the number of windows for searching for the selection vector S here, and L is the selection origin of the program for searching for the selection vector S. Moreover, a user expresses as follows the attribute vector A of the program chosen as the k-th.

[0064]

[Equation 14]

$$A_k = (a_{1k}, a_{2k}, a_{3k}, \dots, a_{nk})$$

[0065] Two or more attribute vectors A for searching for this selection vector S may use the program to which not only the reproduced program but the user did image transcription reservation, for example. In addition, as a program with a thin interest chosen accidentally [ program or ], what the program at the time of real-time playback reproduced only a short time, and was switched to the program of immediately others is not used, in order to search for the selection vector S. That is, the selection vector S is generated using the attribute vector A of the program reproduced beyond fixed time amount. Furthermore, the weight of the program which carried out image transcription reservation, and the program which carried out real-time playback may be changed, and the selection vector S may be generated. For example, the selection vector S may be generated as follows using the constant R to the program which considered real-time playback as the constant P to the program which carried out image transcription reservation.

[0066]

[Equation 15]

$$S = PS_p + RS_r$$

[0067] Su is the selection vector searched for from the attribute vector A of two or more programs which carried out image transcription reservation here, and Sv is the selection vector searched for from the attribute vector A of two or more programs which carried out real-time playback.

[0068] In addition, the generation method of this selection vector S is not restricted to such an approach, but a user can also set it as arbitration.

[0069] Then, the art which sorts out the broadcast program is explained.

[0070] Suppose that it was a vector as the attribute vector A of the sent program shows in the following formulas (4).

[0071]

[Equation 16]

$$A = (3, 1.1, 4, -1, 2.5, \dots, 0, 0, 8) \quad \dots (4)$$

[0072] In order to distinguish whether this program is recorded on the record playback media 15 at this time, an operation as shown in the following formulas (5) is performed.

[0073]

[Equation 17]

$$P = \frac{A \cdot S}{|A| |S|} = \frac{3 \cdot 2.3 + 1.1 \cdot 3.2 + 4 \cdot (-1.1) + \dots + 8 \cdot 0.2}{\sqrt{3^2 + 1.1^2 + 4^2 + \dots + 8^2} \sqrt{2.3^2 + 3.2^2 + (-1.1)^2 + \dots + 0.2^2}} \dots (5)$$

[0074] It judges based on the value of the sorting value P calculated here.

[0075] Here, the semantics of the sorting value P is explained.

[0076] In vector space, when the angle which the attribute vector A and the selection vector S make is set to theta, inner product A·S of the attribute vector A and the selection vector S comes to be shown in the following formulas (6).

[0077]

[Equation 18]

$$A \cdot S = |A| |S| \cos \theta \quad (\text{但し } A \cdot S \text{ は } A \text{ と } S \text{ との内積}) \dots (6)$$

[0078] Therefore, costheta comes to be shown in the following formulas (7).

[0079]

[Equation 19]

$$\therefore \cos \theta = \frac{A \cdot S}{|A| |S|} \dots (7)$$

[0080] That is, the sorting value P will express costheta.

[0081] Here, if the attribute vector A and the selection vector S have turned to this direction, they will be set to P > 0 (case 1). It will be set to P = 0 if the attribute vector A and the selection vector S intersect perpendicularly (case 2). If the attribute vector A and the selection vector S have turned to the opposite direction, they will be set to P < 0 (case 3).

[0082] Then, it can judge as follows to the program to which the attribute vector A is added about relation with a user with the pattern of the taste expressed with the selection vector S.

[0083] It can judge, if in the case of a case 1 a user is interested in the program or taste agrees. Moreover, it can be judged that this inclination is strong, so that it is close to maximum 1.

[0084] In the case of a case 2, it can be judged that a user is not interested in the program.

[0085] In the case of a case 3, a user does not like the program positively or can judge

it to be disagreeable. It can be judged that this inclination is strong, so that it is close to  $-1$  of the minimum value.

[0086] So, in a receiving set 3, if it becomes sorting value  $P > 0.3$  and will record for example, it will be set as the filter section 12. The strong program of interest can be recorded without recording the thin program of interest, an uninterested program, or a disagreeable program by this.

[0087] As mentioned above, while being able to sort out simply the digital content which agreed to a user's taste by choosing the program recorded from the value based on that inner product operation (or playback) using the attribute information and selection information which were expressed with this digital-broadcasting system 1 by the vector, a user's taste can be made to reflect in accuracy.

[0088] In addition, although processing it was presupposed that is recorded on the record playback media 15 was performed in the above example when it was more than constant value with the selection value  $P$ , sorting of a program is not restricted to such processing. For example, when the capacity of the record playback media 15 becomes full and empty area stops existing, you may make it overwrite and eliminate a program with the smallest value of the sorting value  $P$  calculated by the attribute vector  $A$  of the program already recorded, and the selection vector  $S$ . Moreover, you may make it judge whether the lowest selection value  $P$  in the program currently recorded on the record playback media 15 is compared with the selection value  $P$  of the newly received program, and it changes for this new program.

[0089] Moreover, when using a receiving set 3 by the multiple user, the selection vector for every user is set as the filter section 12.

[0090] Moreover, although the attribute vector  $A$  and the selection vector  $S$  are vectors which consist of a  $n$ -dimensional element, they generate the  $m$ -dimensional ( $m < n$ ) vector which extracted and generated only the required element out of  $n$  elements, and you may make it choose a program.

[0091]

[Effect of the Invention] In the broadcast system and receiving set concerning this invention, the attribute information on that digital content is added to the digital content broadcast, and the digital content corresponding to a user's taste is chosen from the broadcast digital contents based on the selection information which showed the taste of this attribute information and a user. And after recording the selected digital content on a record medium, it views and listens, and in this broadcast system and receiving set, it views and listens to the digital content which suited taste out of the recorded digital content.

[0092] In such a broadcast system and a receiving set of this invention, since a digital content is automatically chosen based on the selection information which showed a user's taste, the complicatedness which selects the digital content which he wishes out of many digital contents is lost, and convenience increases. Moreover, in case a

time shift is carried out, only a required digital content can be recorded and a record medium can be used effectively.

[0093] Furthermore, in the broadcast system and receiving set of this invention, the above-mentioned attribute information and selection information are expressed by the vector. And it judges whether a selection means performs the inner product operation of the vector A of attribute information and the vector S of selection information which are added to the broadcast digital content, and chooses the digital content based on the inner product result of an operation.

[0094] For this reason, while being able to sort out the digital content corresponding to a user's taste simply, a user's taste can be made to reflect in accuracy in the broadcast system and receiving set of this invention.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the digital-broadcasting structure of a system of the gestalt of operation of this invention.

[Description of Notations]

1 Digital-Broadcasting System, 2 Broadcasting Station, 3 Receiving Set, 4 Monitor, 5 External Storage, 10 Antenna, 11 Tuner, 12 Filter Section, 13 Decryption Section, 14 Record Playback Section, 15 Record Playback Media, 16 Decoder, 17 Controllers, 18 User Interface Section, 19 Modem